Overview PGA Hazard maps for SodM

Introduction

For the 1st May 2015 Hazard and Risk Assessment a number of production scenarios were evaluated. This included a 33 Bcm/year and a 39.4 Bcm/year production scenario. The original Winningsplan 2013 production scenario (45 Bcm/year) was used as a reference. Additional to these scenarios a flat production schedule of 20 Bcm/year, starting in 2017, was used to test the different elements of the first fully probabilistic hazard and risk assessment.

On the 9th June SodM requested NAM to provide a series of PGA hazard maps to demonstrate the effect on the results of NAM's PGA Hazard Assessment of:

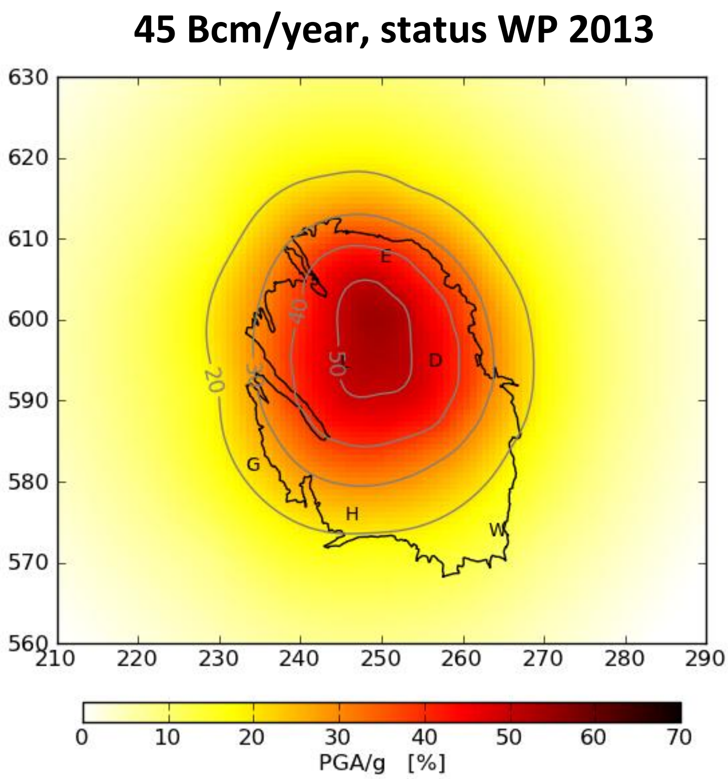
1. Advance in knowledge since the submission on the updated Winningsplan end 2013,
2. Implementation of the different production scenarios considered in the 1st May 2015 Hazard and Risk Assessment.

Advance in knowledge

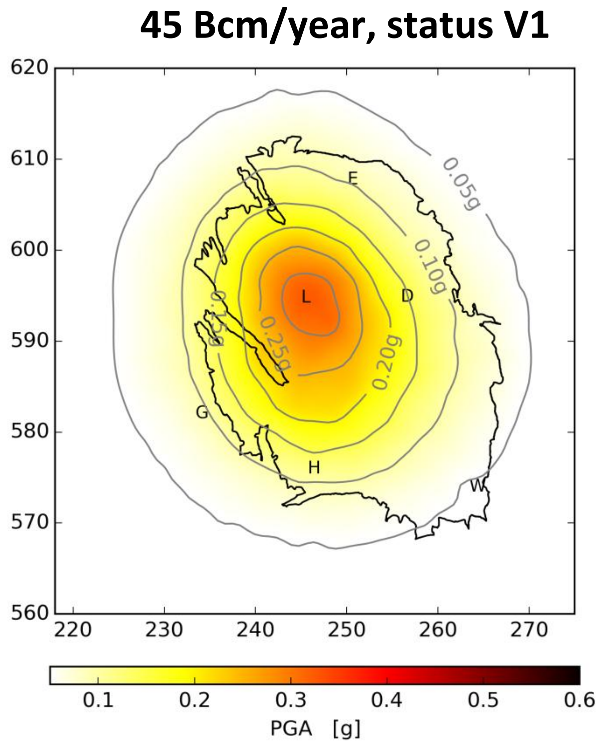
The effect of the substantial progress made in the hazard assessment for induced seismicity in Groningen since the submission of the updated Winningsplan in November 2013 is demonstrated by comparing the PGA hazard map presented in the Technical Addendum to the Winningsplan for the five year period 2013-2018 (0.2% annual chance of exceedance) with a newly created mean PGA hazard map for the same time period, now using the latest insights (Figs 1a and 1b). The maximum PGA has come down from 0.54g presented the Winningsplan 2013, to 0.33g using the current hazard assessment methodology and models, a reduction of almost 40%

Production Scenarios

In Figure 2 mean PGA hazard maps are presented for the three different production scenarios mentioned above (45, 39.4 and 33 Bcm/year) and for the theoretical production schedule of 20 Bcm/year. All hazard maps were made using the same compaction and seismological models and parameters (i.e. V1) for the five year period 1-7-2016 – 1-7-2021. The maximum PGA value for the Winningsplan 2013 production scenario (0.43g) is reduced to 0.35g (39.4 Bcm/year), 0.34g (33 Bcm/year) and ultimately 0.26g for the 20 Bcm/year theoretical production schedule.



a) Max PGA = 0.54g



b) Max PGA = 0.33g

Figure 1 Hazard maps for period 2013-2018; Production scenario used for Winningsplan 2013; Metric: 0.2%/year chance of exceedance (10% chance in 50 years):
a) Base case in Winningsplan 2013
b) V1 model, 1st May 2015

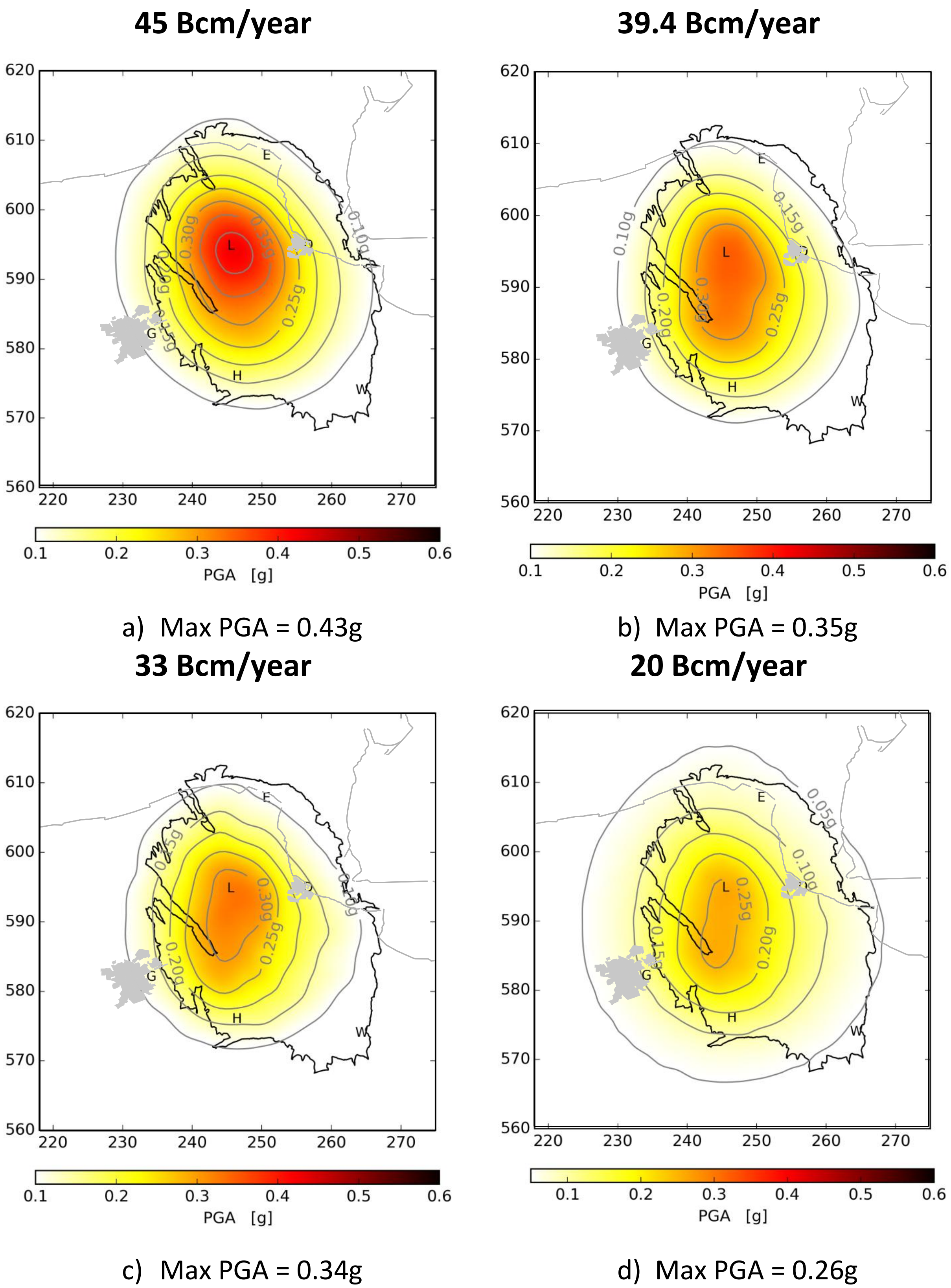


Figure 2 *Mean PGA hazard maps for period 1-7-2016 – 1-7-2021; V1 model, 1st May 2015: Compaction: Inversion – Linear, Activity Rate V1, M ≥ 3.5, Metric: 0.2%/year chance of exceedance (10% chance in 50 years):*

a) Production scenario used for Winningsplan 2013, b) 39.4 Bcm/year, c) 33 Bcm/year, d)20 Bcm/year